REMARKS

Claims 1, 3 and 5-9 remain in this application.. By this amendment, claim 1 is amended.

Claims 1, 3 and 5-9 are rejected under 35 USC 103(a) over Taniguchi (USP 5,578,823 and Van der Mast (USP 5,300,775), in view of Krivanek (USP 4,831,255. This rejection is respectfully traversed.

In essence, the difference between the claimed invention and the references is that Taniguchi is directed to a TEM that requires a plurality of imaging operations to acquire a distribution image of only one element contained in an object to be analyzed because of the use of the TEM. On the other hand, the claimed invention is directed to the combination of a STEM and an EELS, in which a distribution image of plural elements contained in the object to be analyzed is acquired in a single imaging operation to give an improved mapping unit. The claims amendments bring this out more clearly. More specifically, the following differences have been noted in the past.

Taniguchi is directed to a non-scanning type of transmission electron microscope. In Taniguchi, the electron beam is accelerated before irradiation onto the sample by adjustment of the electron gun, and the electron beam is irradiated on the sample in one area. Furthermore, as can be clearly seem from the passage at column 7, lines 11-30:

> An arithmetic image processing unit 14 compares the images of the frame memories 11a and 11b with each other through arithmetic processing, the results of which are successively outputted to a monitor 15. The arithmetic processing executed by the arithmetic image processing unit 14 is either an inter-image subtraction processing or an inter-image division processing. An intensity regulation unit (also referred to as amplitude regulation unit) 12 is a mechanism for attenuating the intensity of the energy-filtered image inputted to the frame memory 11b uniformly with a predetermined ratio. It is presumed that the ratio of attenuation can arbitrarily be selected. The ratio of attenuation may be selected to be "1" (unity), although it is unnecessary when the inter-image division processing is performed.

> Next, a procedure for observing a distribution or map of those elements constituting the specimen which have core-loss energy of ΔE will be described by reference to a time chart of Fig. 2 together with Figs. 3A-3G. Parenthetically, it should be mentioned that in the case of the example illustrated in Figs. 3A-3G, the inter-image subtraction processing is applied.

Thus, Taniguchi requires two or more energy filtered images observed with different acceleration voltages at different timings for observing element distribution. Therefore, Taniguchi inherently requires a plurality of images and thus requires a period for obtaining two or more images. In practice, Taniguchi requires about one hour for observation (two or more times of observation, each requiring 20 to 100 seconds, and an image processing period of 30 minutes to one hour). Furthermore, in Taniguchi, the element distribution has to be obtained for each view field in accordance with the constraints set forth above.

In contrast to this, the claimed invention is directed to a scanning transmission electron microscope (STEM), in which electron beam passed through the sample is accelerated by adjusting a voltage of an acceleration tube built in an electron spectrometer, and the electron beam is scanned on the same in a form of small diameter probe. In the case of the scanning transmission electron microscope of the claimed invention, an element distribution image can be obtained by real time operation by simultaneously measuring electron beams of different energies. Thus, the claimed invention permits observation of element distribution images of high contrast within a period of about several seconds to 80 seconds. Furthermore, the claimed invention permits real time view field selection, switching of elements to be observed and magnification selection, along with observing the element distribution image."

The Examiner's mention of inter-image operations in his rejections recognizes that multiple images are needed in Taniguchi. For example, the claimed division, that the examiner contends is found in the reference based on inter-image division, calls for this. As is clear from the claims, division in the present invention does not take place between two images but between different detected beam intensities in a single scanning operation. Similar comments apply to the rejection of claim 5.

Nothing in Van der Mast or Krivanek makes up for the teaching missing in the primary reference to Taniguchi.

With regard to column 2, lines 18-20, of Van der Mast (USP 5,300,775), it is noted this portion introduces STEM as a similar technique to TEM. The description therein provides nothing about EELS.

With regard to column 6, lines 57-68, this portion describes a special analyzing method using STEM, wherein an object is irradiated by a widened electron beam, and intentional off-focus beam. This technique offers, according to the description, the advantage that a substantially larger object part can be covered for each irradiation. The description therein, however, provides nothing about EELS.

With regard to column 7, lines 1-17, this portion, particularly lines 3-4, describes availability of the irradiation of an object by the widened electron beam defined in column 6, lines 57-68, to the EELs spectrum measuring. The spectral analysis defined in that description is simply that irradiation of wider area at a time may permit the measuring of spatial EELS spectrum of a specimen; this description however discloses none of the aspects of the element mapping technique. What the description in column 7, lines 5-17 discloses is nothing but the making of the energy resolution in EELS spectrum small.

The most characterizing aspect in the present invention is availability of the element mapping in STEM even while the electron beam is on scanning over the object. The element map image is also available for variety of elements as switching is available from one element to be analyzed to the other even while scanning is on-going. It should particularly be noted that these mappings are available in the state "not on completion of scanning" but "while scanning is on-going". It is essential for actualization of this feature that "the computation section is to perform calculations (divisions, background corrections, and obtaining differences) over intensities of the 1st, 2nd, and 3rd electron beams while the electron beam is on-scanning and is to display such calculations on the monitor one by one". thus, the calculation and displaying the calculations on the monitor with the scanning kept on-going permits the user (operator or

observer), at any point in the specimen under analyzing, to switch the element to be analyzed or to shift the field of observation or to zoom the magnification of observation.

The feature, which the above-stated description *"the computation section ... while the electron beam is on-scanning ... one by one"* conveys, can be found as the wording *"in real time"* in the description given in the present specification that *"a control unit that controls ... and detects in real time the element to be analyzed ..."*. This description means that the control unit is composed of a storage section, a control section, and a computation section. In the control unit, to detect (or analyze) desired element in real time, the computing section therein performs above-stated calculation in a "on-detection" base over intensities of the 1st, 2nd, and 3rd electron beams detected by the control section. This "on-detection" base calculation is the real time calculation.

For these reasons, it is submitted that the independent claims, and the dependent claims, would not have been obvious over the cited references. Withdrawal of the rejections is requested.

For the above reasons, it is submitted that the application is in condition for allowance. Prompt consideration and allowance are solicited.

The Office is authorized to charge any additional fees under 37 C.F.R. § 1.16, § 1.17, or § 1.136, or credit of any overpayment, to Kenyon & Kenyon Deposit Account No. 11-0600.

Respectfully submitted,

Dated: July 25, 2005

David J. Zibelli
Registration No. 36,394

KENYON & KENYON
1500 K Street, N.W. - Suite 700
Washington, D.C. 20005 -1257
Tel: (202) 220-4200
Fax: (202) 220-4201

577182